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ABSTRACT

These demonstrations stress individual differences, a concept becoming increasingly important in psychological research. Intended for use in undergraduate psychology courses, four demonstrations that illustrate common examples of human variation are described. The demonstrations deal with the following individual differences: taste blindness, relative length of fingers, sex differences in odor detection, and red-green color blindness. Demonstrations are easy to implement. For example, in the activity concerning taste blindness, a phenylthiocarbamide (PTC)-impregnated strip, easily obtained from biology supply labs, is used to test students for taste blindness. Students learn that PTC has a bitter, unpleasant taste for 70 percent of U.S. adults; for the remaining 30 percent PTC is completely tasteless. This phenomenon is a taste dimorphism which is due to variation in a single pair of genes. (RM)

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CLASSROOM DEMONSTRATIONS: INDIVIDUAL DIFFERENCES

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Paper presented at the Annual Meeting of the American Psychological Association (92nd, Toronto, Ontario, Canada, August 24-28, 1984).

Classroom Demonstrations: Individual Differences

As the field of psychology moves away from the simplistic notion of attempting to describe human behavior adequately in terms of the "average" performance, the concept of individual differences in performance is becoming more important. Recent research suggests that much of the stable variation that is noted among humans is a result of both environmental and genetic influences. I have developed a series of classroom demonstrations which illustrate some common examples of human variation, the major source of which has been attributed to inherited factors.

This series of demonstrations includes a measure of the variability in testing the substance, phenylthiocarbamide (PTC). This phenemenon is a taste dimorphism which is due to variation in a single pair of genes. Individuals who have the recessive gene homozygously are nontasters. In the general population of North America, approximately 70% are tasters and 30% are nontasters.

Also included in this series is a test which identifies red-green color-blindness, and a demonstration of sex difference in detecting the absolute threshold level of the odor, musk.

This series of demonstrations lends itself to use in many different undergraduate psychology courses. I have used it when teaching the unit on behavioral genetics which is so often included in the newer introductory psychology texts. I have also utilized it successfully in child psychology to emphasize the importance of genetic influence on physical and psychological development. Finally, this series of demonstrations can be used in teaching psychology of perception and in courses in comparative and physiological psychology as well.

TASTE BLINDNESS

To about 70% of the adults in the U.S., a rather dilute dose of the chemical compound, phenylthiocarbamide (PTC) has an extremely bitter, unpleasant taste. But for 30% of the population that same concentration of PTC is completely tasteless. Taste sensitivity to PTC has been the topic of many studies of population genetics and cross-cultural differences. Because of the proportions of "tasters" to "nontasters", and because no environmental factors seem to influence this difference in taste sensitivity, it has been hypothesized that PTC taste blindness is the result of a single autosomal recessive gene pair.

PTC-impregnated strips can easily be obtained from most biology supply firms and are very inexpensive. I have demonstrated this particular form of individual difference at least 15 times in various classes and lecture series, and have never failed to find both tasters and nontasters represented in every group.

PTC is not the onl substance which has a strong taste for some and is tasteless for others. Concentrations of sodium benzoate, commonly used as a food preservative, barium sulfate, and saccharine are other substances for which large individual differences have been reported.

RELATIVE LENGTH OF FINGERS

VERY FEW PEOPLE ARE AWARE OF THE FACT THAT THE RELATIVE LENGTHS OF THE INDEX FINGER AND THE RING FINGER SEEM TO BE CONTROLLED BY A SIMPLE GENETIC MECHANISM.

WHEN THE TIP OF YOUR RING FINGER IS PLACED ON A LINE, DOES THE TIP OF THE INDEX FINGER ALSO REACH THE LINE? (USE THE LINE BELOW TO DETERMINE YOUR PHENOTYPE.)

EVIDENCE SUGGESTS THAT, IN FEMALES, SHORT INDEX FINGERS ARE A RECESSIVE TRAIT, WHILE IN MALES SHORT INDEX FINGERS ARE DOMINANT. THIS DIFFERENCE SUGGESTS SOME FORM OF SEX-INFLUENCED GENETIC MECHANISM. AS A RESULT, IN ANY LARGE CLASS, YOU WOULD EXPECT TO FIND MORE SHORT-INDEX FINGERS AMONG MALES THAN FEMALES.

SEX DIFFERENCES IN ODOR DETECTION: MUSK

Females have often been rated to be more sensitive to odors than males, suggesting that on the average the threshold for detecting many odors is lower in females. Interestingly, this sex difference seems to be especially strong for odors which have possible biological significance....steroid sex hormones....for example. Musk, a fragrance used in many perfumes, has a similar odor to some of these steroid preparations, and there does seem to be a reliable sex difference in detecting weak solutions of musk.

Method

Cut a strip of paper 1/2 inch wide and then cut it into lengthwise strips of the following sizes: 2 inches, 3 inches, 4 inches, 5 inches and 6 inches. Into three water-filled bowls add musk perfume, purchased at any drug store, in the following proportions: Bowl One: 1 drop; Bowl Two: 2 drops; Bowl Three: 3 drops. With tweezers dip the one strip into the weakest solution, swirl it around and place it on a flat surface to dry. Repeat this process with two other strips and the two other bowls. Leave two strips dry, as control stimuli. When all strips are dried, ask students to sniff each strip and identify the one with the threshold concentration of musk. Tally male responses separately from female.

RED-GREEN COLOR BLINDNESS

SOME TYPE OF RED-GREEN COLOR BLINDNESS OCCURS IN APPROXIMATELY 8% OF THE POPULATION. MOST INDIVIDUALS WITH THIS FORM OF DEFECTIVE COLOR VISION HAVE DIFFICULTY IN DISTINGUISHING RED FROM GREEN, PROBABLY SEEING BOTH AS SHADES OF WHAT WOULD BE YELLOW TO SOMEONE WITH NORMAL COLOR VISION.

BECAUSE THE CONDITION IS MOST FREQUENTLY ASSOCIATED WITH A RECESSIVE GENE ON THE X CHROMOSOME, ALMOST ALL COLOR BLIND INDIVIDUALS ARE MALE. ON THE OTHER HAND, ONLY FEMALES CAN BE "CARRIERS" OF THE TRAIT (I.E., INDIVIDUALS WITH NORMAL COLOR VISION, BUT POSSESSING ONE ALLELE FOR COLOR BLINDNESS WHICH THEY CAN TRANSMIT TO THEIR OFFSPRING). SONS CAN ONLY INHERIT THIS FORM OF COLOR BLINDNESS FROM THEIR MOTHERS. DAUGHTERS WILL ONLY BE AFFECTED IF THE FATHER IS COLOR BLIND AND THE MOTHER IS A CARRIER.

IN A CLASS OF 100 INDIVIDUALS APPROXIMATELY 8 MALES ON THE AVERAGE WOULD BE EXPECTED TO HAVE SOME DIFFICULTY DISCRIMINATING COLORS. THE ISHIHARA TEST IS A FAST, EFFECTIVE WAY OF MAKING A PRELIMINARY ASSESSMENT